



Prepared for

Santee Cooper Power
1 Riverwood Drive
Moncks Corner, South Carolina 29461

LOCATION RESTRICTIONS COMPLIANCE DEMONSTRATION

SLURRY POND 3&4 WINYAH GENERATING STATION GEORGETOWN, SOUTH CAROLINA

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

201 E. McBee Avenue, Suite 201
Greenville, South Carolina 29601

Project Number GSC5242.01BT

October 2018

Certification Statement – Demonstration of Compliance with Location Restrictions

Federal CCR Rule: 40 CFR §257.60-64

CCR Unit: Slurry Pond 3&4

Certification:

This Location Restrictions Compliance Demonstration was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering, and no other warranty is provided in connection therewith. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Santee Cooper. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others. Although we were not able to independently verify such data, we found that it was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Santee Cooper and their subconsultants. Based on the evaluations presented in this Location Restrictions Compliance Demonstration Report, Slurry Pond 3&4 does not meet the requirements of 40 CFR §257.60 for placement 5 feet above the uppermost aquifer. Therefore, the above-referenced CCR Unit is not, in my professional opinion, demonstrated to be in compliance with the United States Environmental Protection Agency (USEPA) minimum location restriction requirements for the siting criteria of 40 CFR §257.60-64 for existing coal combustion residuals (CCR) surface impoundments.



Seal and Signature:

Carlos F. Benavente

Firm Seal

Printed Name:

Carlos Fabian Benavente

PE License Number:

32067

State:

South Carolina

TABLE OF CONTENTS

CERTIFICATION STATEMENT

| | | |
|-----|--|----|
| 1 | INTRODUCTION | 1 |
| 1.1 | Facility Location..... | 1 |
| 1.2 | Previous Investigations and Reports..... | 3 |
| 1.3 | Site Geology and Hydrogeology | 4 |
| 2 | LOCATION RESTRICTIONS EVALUATION..... | 6 |
| 2.1 | Placement Above the Uppermost Aquifer..... | 6 |
| 2.2 | Wetlands | 7 |
| 2.3 | Fault Areas..... | 7 |
| 2.4 | Seismic Impact Zones..... | 8 |
| 2.5 | Unstable Areas..... | 10 |
| 3 | CONCLUSIONS | 12 |
| 4 | REFERENCES | 13 |

LIST OF TABLES

| | |
|---------|---|
| Table 1 | Location Restriction Compliance Summary |
|---------|---|

LIST OF FIGURES

| | |
|----------|---|
| Figure 1 | Vicinity Map – Slurry Pond |
| Figure 2 | Site Map – Slurry Pond |
| Figure 3 | Modeled Groundwater Elevation Contours Post Pond Drainage |

1 INTRODUCTION

Geosyntec Consultants (Geosyntec) has prepared this *Location Restrictions Compliance Demonstration* on behalf of the South Carolina Public Service Authority doing business as (d.b.a.) Santee Cooper (Santee Cooper). The subject of this compliance demonstration is the coal combustion residual (CCR) unit known as “Slurry Pond 3&4” or the “Slurry Pond” at the Winyah Generating Station (WGS) located in Georgetown, South Carolina (Figure 1). The Slurry Pond is an existing CCR surface impoundment at the WGS site.

On April 17, 2015, the Environmental Protection Agency (EPA) promulgated the federal Coal Combustion Residual Rule (CCR Rule) that establishes national minimum criteria for existing and new CCR landfills and surface impoundments. The Slurry Pond is subject to the CCR Rule as an existing CCR surface impoundment as defined in 40 CFR §257.53, and as such is required to make demonstrations documenting whether or not the CCR unit is in compliance with the location restriction requirements under 40 Code of Federal Regulations (CFR) §257.60 through §257.64 and place appropriate documentation within the site’s Operating Record.

This document serves as the location restrictions demonstration for the Slurry Pond at WGS.

1.1 Facility Location

The WGS is a coal-fired steam electric generating facility located at 661 Steam Plant Drive, Georgetown, SC 29440, owned and operated by Santee Cooper. The WGS site is located approximately 4 miles southwest of the city of Georgetown, South Carolina, and is accessed via US Hwy 17 to Pennyroyal Road. A general site vicinity map is presented on Figure 1. The WGS includes an approximately 2,184-acre parcel for station operations and an adjacent approximately 344-acre parcel of land that is presently undeveloped.

The WGS generates CCRs during power generation and the air quality control process. The CCRs are recycled for beneficial use to the extent possible. Historically, some of the CCRs generated by the WGS have been disposed in six on-site ponds/surface impoundments. One of these ponds is the Slurry Pond, which was designed in 1978 and

commissioned in 1980 and is considered an existing surface impoundment under the CCR Rule. The Slurry Pond is an unlined, 106-acre surface impoundment and designated to receive flue gas desulfurization (FGD) residuals that do not meet minimum specifications for beneficial use as wallboard-grade gypsum. It also receives process water resulted from the power generating activities and stormwater runoffs from the Limestone Slurry/Ball Mill area, the Coal Pile (generally from the west half of the Coal Pile), and the exterior perimeter of the pond. The solids within the sluiced FGD residuals and stormwater runoffs are contained in the Slurry Pond by gravity settling (Geosyntec, 2016a).

The Slurry Pond was constructed by compacting excavated soils from the surface impoundment interior to form the perimeter dikes and the divider dike, which separates the Slurry Pond from the adjacent West Ash Pond (closed) to the southwest. During the initial construction, a finger dike was constructed into the center of the Slurry Pond primarily to allow solids to settle prior to recirculation of the wastewater, but also provided for access, maintenance, and observation of the pond interior. The Slurry Pond perimeter dikes are approximately 30 ft in height in the northern and eastern sections, 26 ft in height in the western section, and 15 ft in height in the southern section (Thomas and Hutton, 2012). The upstream and downstream slopes of the perimeter dikes range from 2 Horizontal to 1 Vertical (2H:1V) to 3H:1V. The dike crest is approximately 12- to 15-ft wide and typically at elevations 37.0 to 39.0 ft National Geodetic Vertical Datum of 1929 (NGVD29; Thomas and Hutton, 2012). Stormwater runoff from the downstream side slope is collected in a stormwater trench, conveyed to Pump Station No. 2, and then pumped into the Slurry Pond.

Previously, the impounded free water within the Slurry Pond was routed via rim ditches and a series of culverts to the West Ash Pond and subsequently pumped across an existing pipe bridge to the South Ash Pond. Currently, the free water is managed by the Floating Pump Station, which routes discharge from the Slurry Pond to the Discharge Canal. The surface of the West Ash Pond was closed, re-graded, and capped in 2015 to drain stormwater runoff by gravity to the Slurry Pond through two 36-in diameter corrugated High Density Polyethylene (HDPE) culverts and four 22-in diameter corrugated HDPE through the west side of the divider dike. The free water within the Slurry Pond has been lowered to an operating elevation of 19.6 ft NGVD29 by the Floating Pump Station as a part of the seismic risk mitigation project (Geosyntec, 2014).

The Slurry Pond is the subject of this demonstration and is shown on Figure 2.

1.2 Previous Investigations and Reports

Santee Cooper has implemented a number of investigations at the WGS site to collect geologic, hydrogeologic, and geotechnical data. This includes previous investigations in and around the footprint of the Slurry Pond. In 1977 and 1978, Soil and Materials Engineers, Inc. (S&ME) performed a general subsurface investigation in support of the construction of the CCR impoundments. Twenty test borings and fifteen test pits were performed within the footprint of the Slurry Pond and the West Ash Pond. Information collected by the S&ME investigation was utilized to assess the suitability of on-site materials for the construction and for the design of the dike structures. In 1999, Paul C. Rizzo and Associates, Inc. (PCRA) conducted a geotechnical and hydrogeologic investigation at WGS primarily on the perimeter dikes of the Slurry Pond, the West Ash Pond, and Unit 2 Slurry Pond. The intent of this investigation was to evaluate subsurface conditions. Eighteen borings were advanced through the perimeter dike centerline surrounding the Slurry Pond and the West Ash Pond, and one piezometer was installed near the toe of the dike.

Geosyntec performed an extensive subsurface investigation and seismic and liquefaction evaluations of the perimeter dikes associated with the Slurry Pond during two separate investigations in Spring and Fall 2013. The investigation and evaluations results were summarized in the *Seismic Investigation Report* (Geosyntec, 2013a). In Summer 2014, four temporary piezometers were installed in the vicinity of the Slurry Pond to measure the phreatic surface within CCRs and perimeter dike during the controlled drawdown of the free water within the surface impoundment. Additional subsurface investigation was performed in Spring 2016 to further evaluate engineering properties of the soft clays encountered within the area during the Spring 2013 investigation

This Federal CCR Rule Location Restrictions Compliance Demonstration is based on and supported by the detailed information contained in the following documents:

- *Subsurface Investigation – Ash and Slurry Pond Dikes*, Winyah Generating Station, Georgetown, South Carolina, 1978, prepared by Soil and Material Engineers, Inc.;

- *Report: Geotechnical/Hydrogeologic Investigation, Winyah Generating Station, 1999, prepared by Paul C. Rizzo Associates, Inc.;*
- *Mitigation Berm Design, 2013b, prepared by Geosyntec Consultants;*
- *Mitigation Drawdown Design, 2014, prepared by Geosyntec Consultants;*
- *History of Construction Report – Slurry Pond, Winyah Generating Station, Georgetown, South Carolina, April 2016, prepared by Geosyntec Consultants; and*
- *2016 Surface Impoundment Periodic Safety Factor Assessment Report – Slurry Pond, Winyah Generating Station, Georgetown, South Carolina, October 2016, prepared by Geosyntec Consultants.*

1.3 Site Geology and Hydrogeology

The WGS site is located within the Atlantic Coastal Plain physiographic province which is a wedge of unconsolidated to well-consolidated, Cretaceous to recent sediments. A review of South Carolina Coastal Plain hydrostratigraphy (Campbell and Coes, 2010) identifies several hydrostratigraphic layers (aquifers and confining units). General information about the regional geologic units is summarized below, from the top unit to the bottom unit:

- Undifferentiated Quaternary Sediments: this geologic unit consists of yellowish-brown and reddish-orange poorly sorted, very fine to very coarse, clayey sand and gravel. Accessory minerals include opaque heavy minerals, mica, and feldspar. The Undifferentiated Quaternary sediments thickness ranges between 20 and 42 ft in the area.
- The Williamsburg Formation (Williamsburg): this geologic unit consists of gray to black interbedded clay and coarse quartz sand overlying shelly clay and calcareous clay. The Williamsburg can include sandy shale, fuller's earth, fossiliferous clayey sand (Lower Bridge Member), and fossiliferous clayey sand and mollusk-rich, bioclastic limestones (Chicora Member). The thickness of the Williamsburg in the vicinity of the site ranges between 30 and 90 ft.

- The Lang Syne Formation: As described in the literature by Muthig and Colquhoun (1988), this geologic unit consists of red and yellow (where weathered) or white, gray, and black (where freshly exposed) interbedded sand, silt, and clay and thin beds of silicified shell debris. Opaline clay stone is the most characteristic lithology of the Lang Syne Formation.
- The Rhems Formation: This geologic unit consists of light-gray to black shale interlaminated with thin seams of fine-grained sand and mica.
- The Peedee Formation: this geologic unit consists of a dark-green to gray, fossiliferous, glauconitic clayey sand and silt. The combined thickness of the Lang Syne, Rhems, and Peedee Formations ranges between 185 and 378 ft in the vicinity of the WGS.

Additional late Cretaceous Formations are present to a depth of approximately 2,200 ft bgs in the area. These formations, in descending order, include: Donoho Creek, Bladen, Coachman, Cane Acre, Caddin, Sheppard Grove, Pleasant Creek, Cape Fear, and undifferentiated Cretaceous sediments (Geosyntec, 2016a).

The aquifers of most interest at this site are the surficial aquifer and Gordon Aquifer. The surficial aquifer is the water-table aquifer and consists mainly of terrace sediments that were deposited during transgressions and regressions of a post-Miocene sea. The surficial aquifer is lithologically heterogeneous but generally consists of quartz gravel and sand, silt, clay, and shelly sand and unconformably overlies the Gordon aquifer, which is the lowermost aquifer of the Floridan Aquifer system. The Gordon Aquifer represents the permeable portion of the Williamsburg Formation (upper Chicora Member) in the vicinity of the site. As detailed in the *Site Hydrogeologic Characterization Study Report* (Geosyntec, 2016c), the surficial aquifer and Gordon Aquifer exhibit similar hydrogeologic properties and are not separated hydrogeologically. Therefore, the Gordon Aquifer and surficial aquifer are collectively termed the surficial aquifer (Geosyntec, 2016c) and are designated as the uppermost aquifer at the site in accordance with 40 CFR §257.40.

Historical groundwater elevation measurements in the surficial aquifer at the site were influenced by the water levels in the slurry ponds and ash ponds. In recent years, two ponds have been closed. Once the new landfill is operational and the remaining ponds are dewatered and closed, the effect of the ponds on recharge to the water table will be

eliminated. For these reasons, a modeled seasonal high water table representing conditions after closure of the slurry ponds and ash ponds was developed (Geosyntec, 2016c). A map of the seasonal high water table conditions used for this location restrictions evaluation is included in this report as Figure 3.

2 LOCATION RESTRICTIONS EVALUATION

The location restrictions under §257.60 through §257.64 include: (1) placement above the uppermost aquifer; (2) wetlands; (3) fault areas; (4) seismic impact zones; and (5) unstable areas. Each of these locations is generally recognized as having the potential to impact the structure of any disposal unit.

2.1 Placement Above the Uppermost Aquifer

40 CFR §257.60(a) states that existing CCR surface impoundments “*must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).*” The “uppermost aquifer” is defined by §257.40 as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility’s property boundary. This definition includes a shallow, deep, perched, confined or unconfined aquifer, provided it yields usable water.

As mentioned, the uppermost aquifer at the site is the surficial aquifer, which is an unconfined aquifer consisting of mixtures of predominantly sand and minor amounts of silt and clay. A map of the modeled seasonal high water table is included in Figure 3 of this report. As shown, the groundwater elevations range from 8 feet NGVD29 in the northwest edge of the Slurry Pond, to elevation 20 feet NGVD29 around the eastern corner of the Slurry Pond. Typical measured seasonal high water levels confirm the modeled results, with water levels ranging from 6.4 feet NGVD29 at monitoring well PPZ-18 on the northwestern edge of Slurry Pond to 20.4 feet NGVD29 at well PPZ-8 on the eastern corner beyond Slurry Pond, as recorded in 2015 (Geosyntec, 2016c)

Engineering construction drawings indicate the bottom of the Slurry Pond to be approximately elevation 13 feet NGVD29 around the northwest edge of the Slurry Pond

(Lockwood Greene, 3-CV-542, 1979) to 19 feet NGVD29 in the eastern corner of the Slurry Pond (Lockwood Greene, 3-CV-545, 1979).

For the foregoing reasons, the Slurry Pond is not in compliance with the requirements of 40 CFR §257.60 for placement above the uppermost aquifer.

2.2 Wetlands

40 CFR §257.61(a) states that existing CCR surface impoundments “*must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates... that the CCR unit meets the requirements of paragraph (a)(1) through (5) of this section.*” Wetlands, as defined in 40 CFR §232.2, means “*those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*”

Waste treatment systems, including treatment ponds designed to meet the requirements of the Clean Water Act (CWA), are not waters of the United States and are exempt from permitting under Section 404 of the CWA. Any wetlands that may exist within these boundaries are exempt from permitting because the CCR ponds are considered part of the existing waste treatment system which is permitted and operated under National Pollutant Discharge Elimination System (NPDES) Permit No. SC0022471. A demonstration to show that the Slurry Pond meets the requirements of paragraphs (a)(1) through (a)(5) of 40 CFR §257.61 is not necessary since the CCR unit is not located in areas delineated or defined as wetlands. The Slurry Pond is considered to be in compliance with the requirements of 40 CFR §257.61 for wetlands.

2.3 Fault Areas

40 CFR §257.62(a) states that existing CCR surface impoundments “*must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.*”

A summary of the structural features in South Carolina are summarized in Maybin (1998) and is provided in the *Site Hydrogeologic Characterization Study* (Geosyntec, 2016d). From an assessment of this information, it is concluded that no structural features indicative of recent (Holocene-age) faulting have been identified within 20 miles of the WGS site.

As such, the Slurry Pond is considered to be in compliance with the requirements of 40 CFR §257.62 for fault areas.

2.4 Seismic Impact Zones

40 CFR §257.63(a) states that existing CCR surface impoundments must not be located in seismic impact zones unless the owner or operator makes certain demonstrations. A seismic impact zone is defined as “*an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth’s gravitational pull (g), will exceed 0.10 g in 50 years.*” While United States Geological Survey (USGS) national seismic hazard maps are the most commonly used resources for the selection of Peak Ground Acceleration (PGA), regional seismic hazard maps developed by local experts consider regional geologic setting and seismicity and are often the preferred alternatives.

The WGS site is located in a seismic impact zone. Accordingly, 40 CFR §257.63(a) requires a demonstration that “*all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.*” This demonstration is made through the engineering analyses and design presented in Attachment 6 of the *2016 Slurry Pond Periodic Safety Factor Assessment Report* (Geosyntec, 2016b), and is further evaluated in the remainder of this section.

A seismic hazard evaluation was performed to select the design acceleration corresponding to a probability of exceedance of 2% in 50 years (i.e. 2,475 year return period). Site response analyses were performed to incorporate the effects of local site conditions on the design acceleration and compute the maximum cyclic shear stresses, which were then used to evaluate liquefaction potential.

The *Seismic Investigation Report* (Geosyntec, 2013a) evaluation of liquefaction potential indicated that liquefiable zones are predominately located along the

downstream toe of the perimeter dike. Significant liquefiable zones are not predicted to be present under the dikes. The predicted liquefiable zones are not continuous from the downstream toe of the perimeter dikes to the dike centerline. However, the predicted liquefiable zones are laterally continuous in most areas along the Pennyroyal creek side and limited areas along other sections of the downstream toe of the perimeter dike. As part of the mitigation design, Geosyntec evaluated the effect of lowered water levels on the stability of downstream perimeter dike slopes and static post-liquefaction slope stability analyses were performed. The post-earthquake or post-liquefaction calculated Factor of Safety (FS) values were less than 1.0 for the dike toe area but 1.1 or greater for potential slip surfaces passing through perimeter dike crest in general.

The mitigation measure selected was the drawdown of the free water surface in the Slurry Pond and was performed under Construction Permit No. 19812-IW (SCDHEC, 2014). The intent of drawdown in the context of the proposed seismic mitigation measure refers to lowering of the water level in the Slurry Pond to appropriate levels to: (i) result in acceptable performance of the Slurry Pond and the West Ash Pond dikes under the design seismic loading conditions presented in the Seismic Investigation Report; and (ii) provide the additional benefit of mitigating the flow potential of the contained CCR materials by the removal of free water (supernatant) in the unlikely event of a dike failure due to the design seismic loading. Compared to a toe buttress berm or other ground improvement methods that are designed for acceptable performance under particular seismic loading, the drawdown mitigation measure has the added benefit of mitigating the flow potential of the contained CCR materials in the event of a dike failure.

The seismic hazard evaluation was updated in the *2016 Periodic Factor of Safety Assessment – Slurry Pond* (Geosyntec, 2016b). Using the South Carolina Department of Transportation (SCDOT) Geotechnical Design Manual (GDM) (SCDOT, 2010) seismic hazard maps for “geologically realistic” site conditions as well as for the hypothetical “hard-rock” conditions. The Site PGA is 0.16g for “geologically realistic” conditions. A target acceleration response spectrum was selected using the SCDOT seismic hazard maps for a “geologically realistic” site at different spectral periods (or frequencies). Site response analysis performed during the seismic evaluation computed the cyclic shear stresses within representative soil profiles located along the perimeter dike centerline. Computed cyclic shear stresses were applied for the liquefaction potential analysis and were also utilized to evaluate the seismic safety factor as a part of

the safety factor assessment using DEEPSOIL[®] (Hashash et al., 2015), a one-dimensional nonlinear site response analysis program.

Site response analyses were conducted using DEEPSOIL[®] (Hashash et al., 2015), a one-dimensional nonlinear site response analysis program. Three representative profiles to 100 feet bgs were developed for the perimeter dike. These profiles were extended to a depth of 500 feet bgs, consistent with the definition of “geologically realistic” soil conditions described in the Attachment 8 of the *2016 Periodic Factor of Safety Assessment – Slurry Pond* (Geosyntec, 2016b). The site response analysis presented in that report considers the full depth of soil columns (i.e., 500 feet bgs), but results are presented for soil columns to a depth of 100 feet bgs to emphasize the near-surface response. The calculated FS for each of the cross sections exceed the respective target FS for static and seismic FS.

For the foregoing reasons, the Slurry Pond is considered to be in compliance with the requirements of 40 CFR §257.63 for seismic impact zones.

2.5 Unstable Areas

40 CFR §257.64(a) indicates that existing CCR surface impoundments “*must not be located in an unstable area unless the owner or operator demonstrates... that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.*” An unstable area is defined as “*a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.*” To assess whether the Slurry Pond may be situated in an unstable area, the following factors were considered:

- On-site or local soil conditions that may result in differential settlements;
- On-site or local soil conditions that may constitute poor foundation conditions;
- On-site or local geologic or geomorphologic features (i.e., potential karst terrain); and

- On-site or local human-made features or events (both surface and subsurface).

Potentially liquefiable zones were encountered in the subsurface soils adjacent and downstream to the perimeter dikes in some areas. The “Liquefaction Potential Analysis: Slurry Pond” calculation package, provided as Attachment 7 to the *2016 Slurry Pond Periodic Safety Factor Assessment Report* (Geosyntec, 2016b) presents analyses to address on-site or local soil conditions in and around the Slurry Pond. The liquefaction potential was evaluated for soil borings and cone penetration test (CPT) soundings advanced through the Slurry Pond perimeter dike based on geotechnical information collected during Geosyntec’s 2013 geotechnical subsurface investigations and a historical investigation performed in 1999 (PCRA, 1999). Borings and soundings located at the perimeter dike toe were analyzed during an evaluation of “Unstable Areas” in accordance with the CCR Rule. The liquefaction analyses were performed on both the CPT soundings and SPT borings. The methodology to compute the potential of soils to liquefy and the factor of safety against liquefaction are described below.

Global slope stability analyses were performed using Spencer’s method (Spencer, 1973), as implemented in the computer program SLIDE[®], version 6.037 (Rocscience, 2015). The Factors of Safety values calculated for static conditions under maximum normal storage pool, static maximum surcharge pool, and seismic maximum normal storage pool for each cross section exceeded the target FS. Furthermore, the FS calculated for liquefaction slope stability for Cross Section A also exceeded the target FS. The dike fill and foundation soils directly underlying the Slurry Pond perimeter dikes (i.e., Cross Sections B, C, D, and E) were not found to be susceptible to liquefaction during the design earthquake, and thus the liquefaction safety factor of the perimeter dike is not required to be evaluated during the periodic safety factor assessment (Attachment 8, Geosyntec, 2016b).

For the foregoing reasons, the Slurry Pond is considered to be in compliance with the requirements of §257.64 for unstable areas.

3 CONCLUSIONS

A compliance summary of the CCR Rule location restrictions addressed in this document are provided in Table 1 below.

Table 1 Location Restriction Compliance Summary

| <i>Winyah Slurry Pond 3&4</i> | | Compliant? | |
|-----------------------------------|-----------------------------------|------------|-----------|
| Regulation | CCR Location Restriction | YES | NO |
| 257.60 | Placement Above Uppermost Aquifer | | X |
| 257.61 | Wetlands | X | |
| 257.62 | Fault Areas | X | |
| 257.63 | Seismic Impact Zones | X | |
| 257.64 | Unstable Areas | X | |

4 REFERENCES

- Campbell, B.G., and Coes, A.L., eds., 2010. Groundwater Availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls.
- Geosyntec Consultants, Inc. 2016a. *History of Construction Report – Slurry Pond 3&4*, Winyah Generating Station, Georgetown, South Carolina. October.
- Geosyntec Consultants, Inc. 2016b. *2016 Slurry Pond Periodic Safety Factor Assessment Report*, Winyah Generating Station, Georgetown, South Carolina. October.
- Geosyntec, 2016c. *Groundwater Modeling Report, Appendix M of the Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina. April.
- Geosyntec Consultants, Inc. 2016d. *Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina. April.
- Geosyntec Consultants, Inc. 2014. *Mitigation Drawdown Design for Increased Seismic Stability; Slurry Pond 3&4 and West Ash Pond*, Winyah Generating Station, Georgetown, South Carolina. 8 July.
- Geosyntec Consultants, Inc. 2013a. *Seismic Investigation Report: Slurry Ponds 3&4 and West Ash Pond* Winyah Generating Station, Georgetown, South Carolina. July.
- Geosyntec Consultants, Inc. 2013b. *Mitigation Berm Design* letter report with attached “Slope Stability Analysis Calculation Package.” November.
- Hashash, Y.M.A., Musgrove, M.I., Harmon, J.A., Groholski, D.R., Phillips, C.A., and Park, D. 2015, “DEEPSOIL[®] 6.1, User Manual”, Board of Trustees of University of Illinois at Urbana-Champaign, Urbana, Illinois.
- Lockwood Greene Engineers, 1979. *Santee Cooper Winyah Generating Station Unit 3 Plan – Ash Pond 3&4*. Drawings for Construction Numbers 3-CV-542 and 3-CV-545.

Maybin, A.H., Clendenin, C.W., Jr., and Daniels, D.L., 1998. Structural Features of South Carolina: South Carolina Geological Survey General Geologic Map Series 4, 1:500,000.

Paul C. Rizzo Associates, Inc., 1999. *Report: Geotechnical/Hydrogeologic Investigation Winyah Generating Station*, Georgetown, South Carolina.

Soil & Material Engineers, Inc. 1978. *Subsurface Investigation – Ash and Slurry Pond Dikes*, Winyah Generating Station, Georgetown, South Carolina.

South Carolina Department of Transportation (SCDOT), 2010. Geotechnical Design Manual, seismic hazard maps.

South Carolina Department of Health and Control (SCHEC), 2014. Construction Permit No. 19812-IW, Santee Cooper (SCPSA) Winyah Generating Station, Mitigation Drawdown for Increased Seismic Stability, Georgetown County. 19 August.

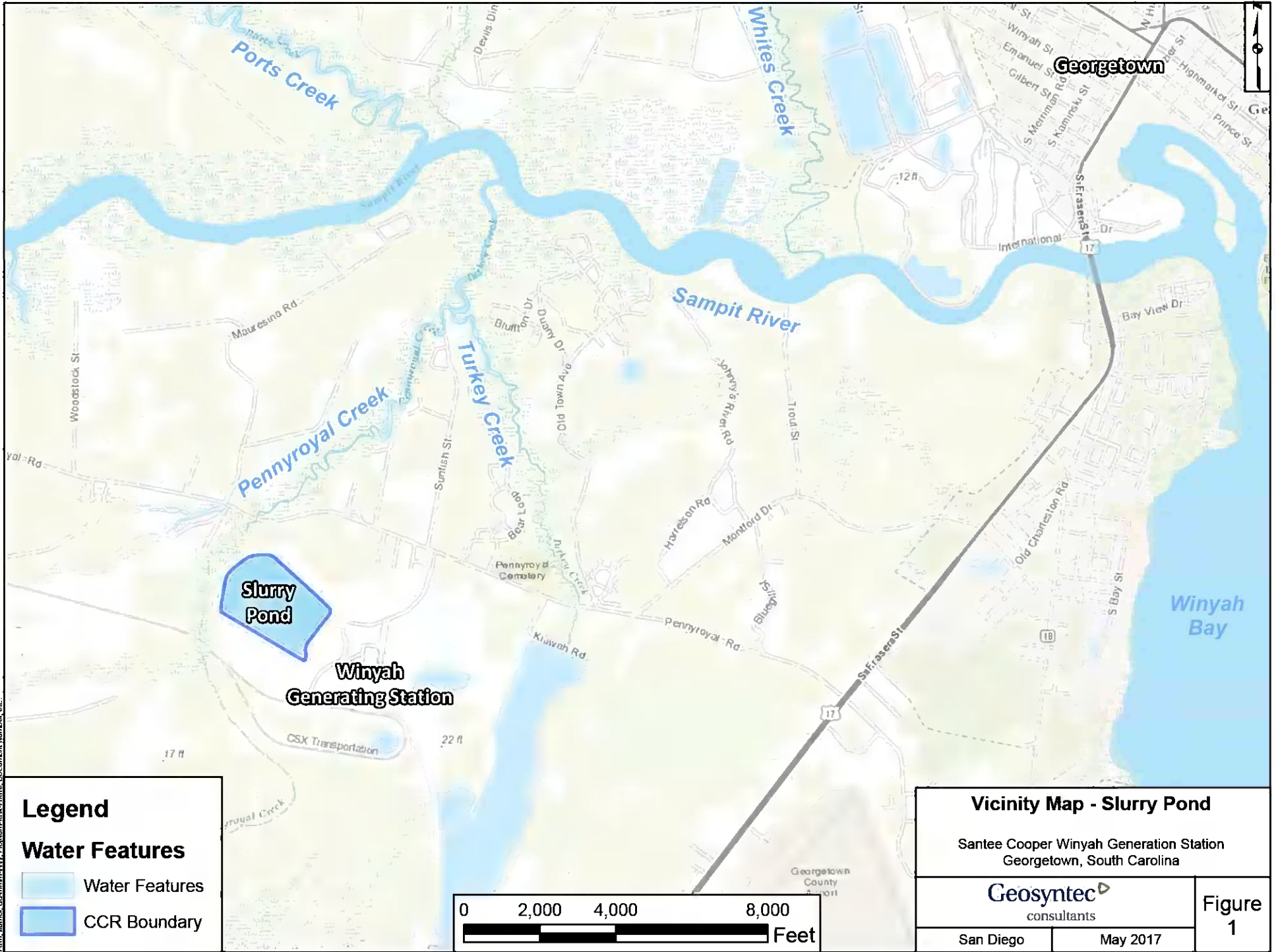
Rocscience, 2015. “SLIDE[®] - 2-D Limit Equilibrium Slope Stability for Soil and Rock Slopes, version 60.37.” User’s Guide, Rocscience Software, Inc. Toronto, Ontario, Canada.

Spencer, 1973. “The Thrust Line Criterion in Embankment Stability Analysis,” *Geotechnique*, Volume 23, No. 1,, pp. 85-100. March.

Thomas and Hutton, 2011. Topographic Survey of a Portion of Santee Cooper Winyah Generating Station. Revised 2012.

Thomas and Hutton, 2016. Survey of Dike Crests at Santee Cooper Winyah Generating Station.

FIGURES

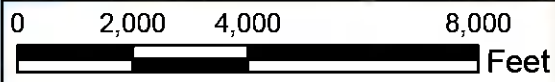


Path: author:dd:man:www:Program:look:Phone:Document Number: etc.

Legend

Water Features

- Water Features
- CCR Boundary



Vicinity Map - Slurry Pond

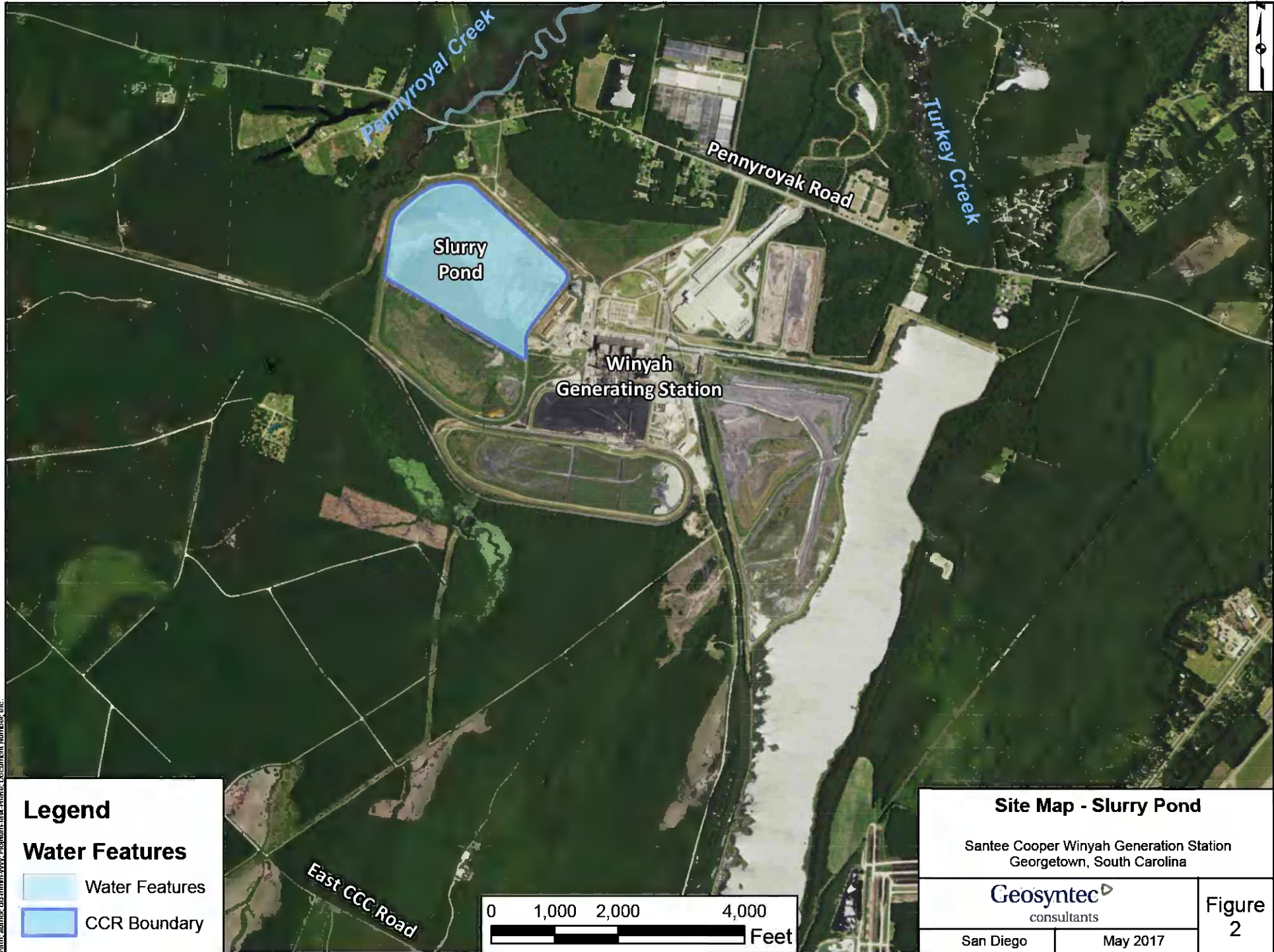
Santee Cooper Winyah Generation Station
Georgetown, South Carolina

Geosyntec
consultants

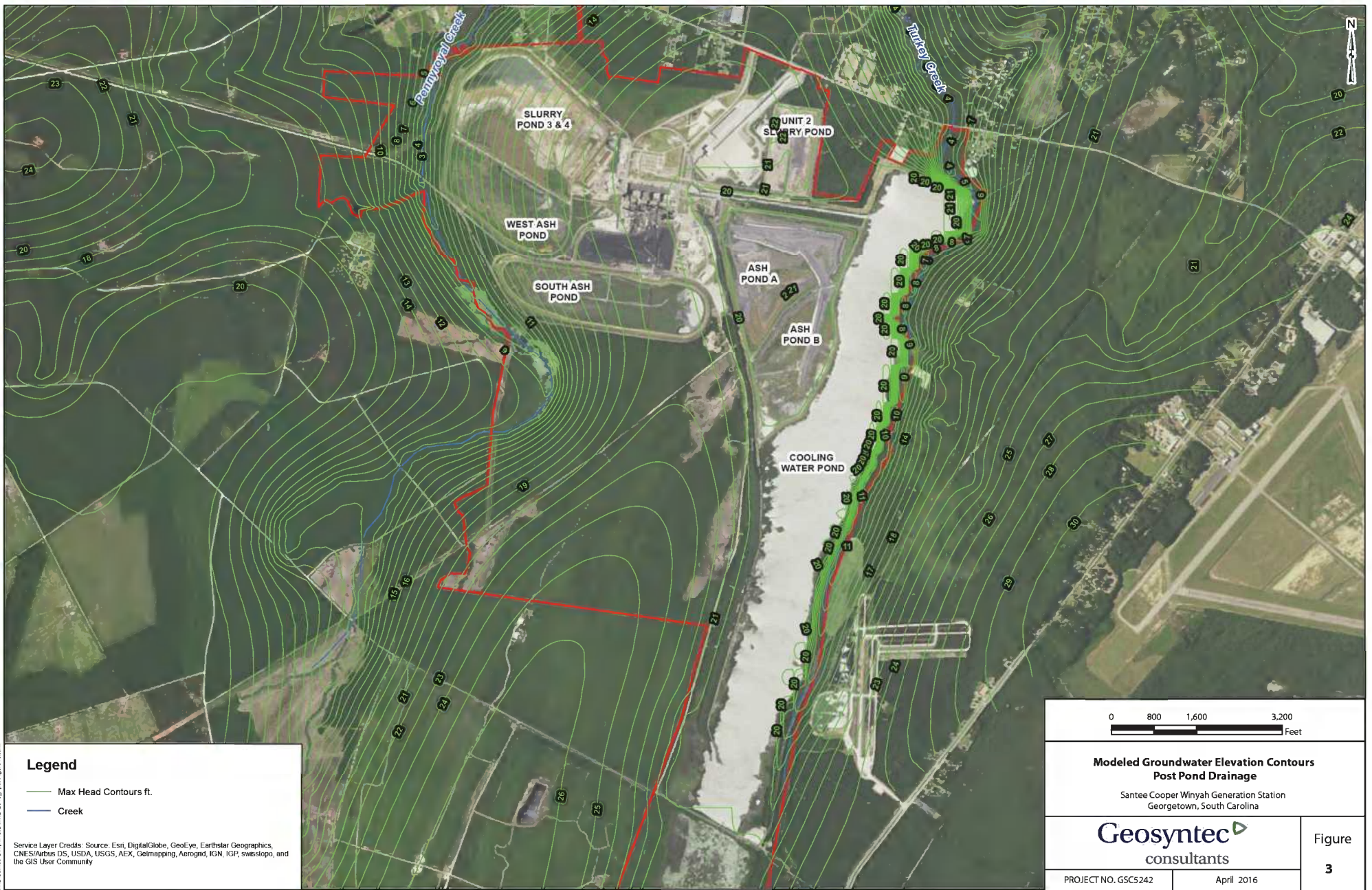
San Diego

May 2017

Figure
1



Path: author:del:man:www:Program:ink:Phone: Document Number: etc.



K:\GIS\Projects\Cooper\GSC5242\2016_April\Figure 3.mxd

Legend

- Max Head Contours ft.
- Creek

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

| | |
|---|------------|
| <p>0 800 1,600 3,200 Feet</p> | |
| <p>Modeled Groundwater Elevation Contours Post Pond Drainage</p> <p>Santee Cooper Winyah Generation Station Georgetown, South Carolina</p> | |
| <p>Geosyntec consultants</p> | |
| PROJECT NO. GSC5242 | April 2016 |

Figure
3